

CLAIMS

What is claimed is:

- 1 1. A method for adaptive load balancing comprising the steps of:
 - 2 monitoring operating conditions of a server;
 - 3 determining, based on the operating conditions, whether to send a behavior
 - 4 modification hint to one or more clients that are served by the server;
 - 5 generating the behavior modification hint based on the operating conditions; and
 - 6 sending the behavior modification hint to the one or more clients.
- 1 2. The method of Claim 1, wherein the server is an AAA server and the one or more
- 2 clients are AAA clients.
- 1 3. The method of Claim 2, wherein the step of sending the behavior modification hint
- 2 comprises sending a RADIUS message containing the behavior modification hint in a vendor
- 3 specific attribute within the RADIUS message.
- 1 4. The method of Claim 1, wherein the step of sending the behavior modification hint
- 2 comprises sending a particular message containing the behavior modification hint to a
- 3 particular client of the one or more clients, where the particular message is a response
- 4 message to a request message sent by the particular client to the server.
- 1 5. The method of Claim 1, wherein the step of monitoring the server's operating
- 2 conditions comprises monitoring at least one of CPU usage percentage, memory usage
- 3 percentage, network conditions, and number of processes running.

1 6. The method of Claim 1, further comprising the step of determining the one or more
2 clients to which to send the behavior modification hint based on a predefined list of clients.

1 7. The method of Claim 1, further comprising the step of determining the one or more
2 clients to which to send the behavior modification hint based on a network device group.

1 8. The method of Claim 1, further comprising the step of determining the one or more
2 clients to which to send the behavior modification hint based on operating conditions for the
3 server relative to each of the one or more clients.

1 9. The method of Claim 1, wherein the server is one of multiple servers providing a
2 particular service; the behavior modification hint comprises a suggestion of one or more
3 alternative servers; and the method further comprises the step of determining the one or more
4 alternative servers based on operating conditions for each server of the one or more
5 alternative servers.

1 10. The method of Claim 9, wherein the step of determining the one or more alternative
2 servers further comprises the server obtaining the operating conditions of the one or more
3 alternative servers over a network.

1 11. The method of Claim 1, wherein the step of determining when to send a behavior
2 modification hint is based on network conditions of one or more networks providing
3 communication between the server and the one or more clients, wherein the network
4 conditions comprise at least one of:

5 a ping time from the server to a computer on the one or more networks;

6 a round trip time of a message sent to a particular client;

7 a quality of service guaranteed to one or more clients; and
8 operating conditions of a device on the one or more networks used to route messages.

1 12. The method of Claim 1, wherein the step of sending a behavior modification hint
2 further comprises the steps of:

3 sending a code to the one or more clients; and
4 generating the code based on why it was determined to send a message to the one or
5 more clients.

1 13. The method of Claim 1, wherein the step of determining when to send a behavior
2 modification hint is based on a scheduled event related to the server.

1 14. The method of Claim 13, wherein the scheduled event related to the server is selected
2 from a group consisting of server shutdown, server maintenance, and server backup.

1 15. The method of Claim 1, wherein the step of determining when to send a behavior
2 modification hint is based on a server detecting that a particular client has sent one or more
3 retry messages, wherein a retry message is a second or subsequent message corresponding to
4 a particular request for service from the particular client.

1 16. A method for adaptive load balancing comprising the steps of:

2 receiving a behavior modification hint from a first server providing a first service,
3 wherein the behavior modification hint comprises the first server's operating
4 conditions; and
5 altering one or more functional aspects of a client based on the behavior modification
6 hint, wherein the one or more functional aspects of the client comprise at least
7 one of:

8 a configured timeout value for the first server for the first service and
9 a preferred server setting for the first service.

1 17. The method of Claim 16, wherein the step of receiving a behavior modification hint
2 comprises receiving a particular message containing the behavior modification hint from the
3 first server, where the particular message is sent by the first server in response to a request
4 message sent by the client to the first server.

1 18. The method of Claim 16, wherein the step of altering one or more functional aspects
2 of a client comprises altering the configured timeout value for the first server for the first
3 service.

1 19. The method of Claim 18, further comprising the step of generating a new timeout
2 value based on the first server's operating conditions.

1 20. The method of Claim 16, wherein the behavior modification hint contains a list of one
2 or more alternative servers and the step of altering one or more functional aspects of a client
3 comprises altering the preferred server setting for the first service based on the list of one or
4 more alternative servers.

1 21. The method of Claim 20, wherein a second server is one of the servers in the list of
2 one or more alternative servers and the method further comprises the step of connecting to
3 the second server.

1 22. The method of Claim 21, further comprising the step of generating a new timeout
2 value based on the second server's operating conditions.

1 23. The method of Claim 16, wherein the step of receiving a behavior modification hint
2 further comprises the steps of:

3 receiving a RADIUS message containing the behavior modification hint in a vendor
4 specific attribute within the RADIUS message; and
5 interpreting the behavior modification hint contained within the RADIUS message.

1 24. A computer-readable medium carrying one or more sequences of instructions for
2 adaptive load balancing, which instructions, when executed by one or more processors, cause
3 the one or more processors to carry out the steps of:

4 monitoring operating conditions of a server;
5 determining, based on the operating conditions, whether to send a behavior
6 modification hint to one or more clients that are served by the server;
7 generating the behavior modification hint based on the operating conditions; and
8 sending the behavior modification hint to the one or more clients.

1 25. An apparatus for adaptive load balancing, comprising:
2 means for monitoring operating conditions of a server;
3 means for determining, based on the operating conditions, whether to send a behavior
4 modification hint to one or more clients that are served by the server;
5 means for generating the behavior modification hint based on the operating
6 conditions; and
7 means for sending the behavior modification hint to the one or more clients.

1 26. An apparatus for adaptive load balancing, comprising:
2 a network interface that is coupled to a data network for receiving one or more packet
3 flows therefrom;

4 a processor;
5 one or more stored sequences of instructions which, when executed by the processor,
6 cause the processor to carry out the steps of:
7 monitoring operating conditions of a server;
8 determining, based on the operating conditions, whether to send a behavior
9 modification hint to one or more clients that are served by the server;
10 generating the behavior modification hint based on the operating conditions;
11 and
12 sending the behavior modification hint to the one or more clients.

1 27. A computer-readable medium carrying one or more sequences of instructions for
2 adaptive load balancing, which instructions, when executed by one or more processors, cause
3 the one or more processors to carry out the steps of:
4 receiving a behavior modification hint from a first server providing a first service,
5 wherein the behavior modification hint comprises the first server's operating
6 conditions; and
7 altering one or more functional aspects of a client based on the behavior modification
8 hint, wherein the one or more functional aspects of the client comprise at least
9 one of a configured timeout value for the first server for the first service and a
10 preferred server setting for the first service.

1 28. An apparatus for adaptive load balancing, comprising:
2 means for receiving a behavior modification hint from a first server providing a first
3 service, wherein the behavior modification hint comprises the first server's
4 operating conditions; and

5 means for altering one or more functional aspects of a client based on the behavior
6 modification hint, wherein the one or more functional aspects of the client
7 comprise at least one of a configured timeout value for the first server for the
8 first service and a preferred server setting for the first service.

1 29. An apparatus for adaptive load balancing, comprising:
2 a network interface that is coupled to a data network for receiving one or more packet
3 flows therefrom;
4 a processor;
5 one or more stored sequences of instructions which, when executed by the processor,
6 cause the processor to carry out the steps of:
7 receiving a behavior modification hint from a first server providing a first
8 service, wherein the behavior modification hint comprises the first
9 server's operating conditions; and
10 altering one or more functional aspects of a client based on the behavior
11 modification hint, wherein the one or more functional aspects of the
12 client comprise at least one of a configured timeout value for the first
13 server for the first service and a preferred server setting for the first
14 service.